



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/756,953	01/13/2004	Christian Peter Behrenbruch	13595 US	3305
23719 7590 11/26/2007 KALOW & SPRINGUT LLP 488 MADISON AVENUE 19TH FLOOR NEW YORK, NY 10022			EXAMINER TORRES, JOSE	
			ART UNIT 2624	PAPER NUMBER
			MAIL DATE 11/26/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No. 10/756,953	Applicant(s) BEHRENBRUCH ET AL.	
	Examiner José M. Torres	Art Unit 2624	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 September 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-14 and 16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 September 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Comments*

1. The Amendment filed on September 4, 2007 has been entered and made of record.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-5, 11-14, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith (US 2004/0064037) in view of Kruger et al. ("Digital Angiography Using a Matched Filter", IEEE Transactions on Medical Imaging, Vol. MI-1, No. 1, July 1982, pp. 16-21).

As to claims 1, 14, and 16, Smith teaches a method/apparatus/computer readable medium of dynamic medical imaging of a subject (Paragraphs [0046] and [0048]) comprising the steps of: obtaining a plurality of time separated images of the subject (FIG. 1, "Patient 20", Paragraphs [0032], [0034], [0038] and [0039]); registering the plurality of time separated images together to match corresponding locations in the images to each other ("Spatially Aligned", Paragraph [0067]); and measuring from the

registered images a temporal behaviour ("Percent Change of Intensity") of an imaged region at a location in the subject (Paragraphs [0060] and [0072]).

However, Smith does not explicitly disclose measuring a quality of the registration of the time separated images by: comparing the measured temporal behaviour with a model of the expected temporal behaviour of the imaged region to calculate a level of agreement between the measured temporal behaviour and the expected temporal behaviour, and determining a measure of the quality of the registration of the time separated images from said calculated level of agreement, wherein said measure of the quality of registration indicates that the registration quality is poorer when the calculated level of agreement between the measured temporal behaviour and the expected temporal behaviour is lower.

Kruger et al. teaches measuring a quality of the registration of the time separated images by: comparing the measured temporal behaviour ("Measured Contrast Dilution Curve") with a model of the expected temporal behaviour (FIG. 1, "Typical Contrast Dilution Curve") of the imaged region to calculate a level of agreement between the measured temporal behaviour and the expected temporal behaviour, and determining a measure of the quality of the registration of the time separated images from said calculated level of agreement, wherein said measure of the quality of registration indicates that the registration quality is poorer when the calculated level of agreement between the measured temporal behaviour and the expected temporal behaviour is lower (As stated in Section VI a comparison is made between the measured contrast dilution curve and the typical contrast dilution curve of FIG. 1, and when "large flow

Art Unit: 2624

differentials occurs" (quality poor) the curve-fitting routines are used to form two filters. Since the large flow differentials exists, it is representative that a low quality is present, see Sections III and VI, pp. 18-21).

Therefore, in view of Kruger et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Smith's process by incorporating the method step of measuring the quality of registration by comparing the measured contrast dilation curve to a typical contrast dilation curve and determine whether they look alike and if large differential occurs, being representative of poor quality, apply a curve-fitting routine to form matched filters in order to provide a powerful diagnostic tool for imaging dilute amounts of contrast materials through the cardiovascular anatomy and provide a matched filter function (Section I, pp. 16-17).

As to claim 2, Kruger et al. further teaches wherein obtaining the images involves the use of an imaging agent ("Iodinated Contrast Material") and said model is a model of the temporal behaviour of the imaging agent (FIG. 1, "Typical Contrast Dilution Curve", Abstract and Section III, pp. 16 and 18-19).

As to claim 3, Kruger et al. further teaches wherein the imaging agent is a contrast agent ("Contrast Material", Section III, pp. 18-19).

As to claim 4, Smith further teaches wherein the level of agreement between the measured temporal behaviour and the expected temporal behaviour is displayed (The

level of agreement, being the comparison between the baseline data and the measured percent change in intensity, is displayed with colors, see Paragraph [0080]).

As to claim 5, Smith further teaches wherein the level of agreement is displayed overlying an image of the subject (FIG. 7A, "Parametric Image 90", Paragraph [0080]).

As to claim 11, Kruger et al. further teaches wherein the model is a temporal model of the take-up and wash-out of an imaging agent administered to the subject (FIG. 1 shows how the signal behaves along the time, the take-up being the curve with a positive slope and the wash-out being the curve with a negative slope, see Section III, pp. 18-19).

As to claim 12, Kruger et al. further teaches wherein the subject is a living human ("Patient"), animal ("Dog") or plant (See Sections III and VI, pp 18-21).

As to claim 13, Kruger et al. further teaches wherein the images are acquired by one of magnetic resonance imaging, computed tomography, positron emission tomography, single photon emission computed tomography, nuclear medicine, ultrasound, x-ray and optical imaging ("X-Ray", Section IV, pp. 19-20).

4. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of Kruger et al. as applied to claim 1 above, and further in view of Suri

(U.S. Pat. No. 6,718,055). The teachings of Smith and Kruger et al. have been discussed above.

As to claim 6, Smith and Kruger et al. fails to teach re-executing the step of registering the plurality of time separated images together in imaged regions where the level of agreement is poor.

Suri teaches re-executing the step of registering the plurality of time separated images together in imaged regions where the level of agreement is poor (When the convergence is not achieved, being a low registration quality, the alignment algorithm is repeated, see Col. 6 lines 26-59).

Therefore, in view of Suri, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Smith and Kruger et al. by incorporating the method step or repeating the alignment algorithm when the convergence is not met in order to perform image correction on images where motion was induced during collection caused by respiration, muscle flex and the like (Col. 5 lines 21-25 and 37-56).

As to claim 7, Suri further teaches wherein the registration uses a parameterized process and is re-executed using different registration parameters ("Down Sampling, Size reduction, and Smoothing, see Col. 6 lines 38-41).

As to claims 8 and 9, Suri further teaches the registration is re-executed at different resolution and scale (Different image sizes and Multi-resolution, see Col. 5 lines 37-56, Col. 6 lines 26-41 and Col. 8 lines 13-27).

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of Kruger et al. further in view of Suri as applied to claim 6 above, and further in view of Hossak et al. (U.S. Pat. No. 6,360,207). The teachings of Smith, Kruger et al., and Suri have been discussed above.

As to claim 10, Smith, Kruger et al., and Suri fails to disclose wherein the registration comprises searching through a search window defined in one of the images and the registration is re-executed using a different sized search window.

Hossak et al. teaches wherein the registration comprises searching through a search window defined in one of the images and the registration is re-executed using a different sized search window (Col. 25 lines 40-67).

Therefore, in view of Hossak et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Smith, Kruger et al., and Suri by incorporating the method step of adaptively changing the search area into a smaller or larger search area and re-execute the image registration in order to speed up the search for estimated motions and obtain a high degree of confidence when the detected motions exhibit little variation (Col. 25 lines 40-67).



***Response to Arguments***

***Objections to the Drawings***

6. New replacement sheet for Figure 4 has been filed, in order to correct the typological error of Reference Character "410", now "412". Therefore, the objection has been removed.

***Claim Objections***

7. Claim 1 has been amended to remove "-" in line 1, to correct the minor informality. Therefore, the objection has been removed.

***Claim Rejections under 35 U.S.C. § 112***

8. Claim 1 has been amended to recite, "a temporal behaviour" and "a level of agreement" in lines 5 and 9, respectively, in order to provide proper antecedent basis for the limitations in the claim. Therefore, the rejection has been removed.

***Claim Rejections under 35 U.S.C. § 101***

9. Claim 14 has been amended to recite, "A computer readable storage medium carrying a computer program" in order to be considered statutory. Therefore, the rejection has been removed.

Claim 15 has been cancelled. Therefore, the rejection has been removed.

***Claim Rejections under 35 U.S.C. § 102***

Art Unit: 2624

10. With respect to claims 1-5, 11-14, and 16, Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

*Claim Rejections under 35 U.S.C. § 103*

11. With respect to claims 6-10, Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Faber et al. disclose a Method for Operating a Medical Imaging Examination Apparatus, and Meijering et al. disclose a Retrospective Motion Correction in Digital Subtraction Angiography: A Review.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 2624

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José M. Torres whose telephone number is 571-270-1356. The examiner can normally be reached on Monday thru Friday: 8:00am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on 571-272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMT  
11/20/2007

  
JINGGE WU  
SUPERVISORY PATENT EXAMINER